

# HEDYOTIS AUSTRALIS (RUBIACEAE) NEW TO MISSOURI AND FLORIDA AND RELATED SPECIES IN THE SOUTH-CENTRAL UNITED STATES

Walter H. Lewis

Department of Biology  
Washington University  
St. Louis, Missouri 63130, U.S.A.

## ABSTRACT

The distribution of white-flowered *Hedyotis australis* is extended to Missouri and Florida as well as within Alabama, Arkansas, Mississippi, and Tennessee. This distribution is compared to allied homostylous species *H. crassifolia* and *H. rosea* which also flower as winter annuals in the south-central United States. *Hedyotis crassifolia* is a diploid species having a flowering peak earlier than the tetraploid *H. australis*. An example of possible out-crossing within *H. crassifolia* via bee pollination is discussed. *Hedyotis rosea* is now considered extirpated in Missouri.

## RESUMEN

*Hedyotis australis* de flores blancas se encuentra distribuida por Missouri y Florida así como también en Alabama, Arkansas, Mississippi, y Tennessee. Su distribución se compara la de las otras especies homostilas *H. crassifolia* y *H. rosea* las cuales florecen como anuales de invierno en la región centro-sur de Estados Unidos. La especie diploide *Hedyotis crassifolia* tiene un pico de floración más temprano que la especie tetraploide *H. australis*. Se discute un ejemplo de posible entrecruzamiento dentro de *H. crassifolia* vía polinización por abejas. *Hedyotis rosea* se considera ahora extinguida en Missouri.

## INTRODUCTION

Three winter annual and homostylous bluets (*Hedyotis* or *Houstonia*) flower and fruit in the south-central U.S. largely between January and April. The most common and widely distributed of these is the purple- or violet-colored *Hedyotis crassifolia* Raf. (*Houstonia pusilla* Schöpfung). Less well-known is a smaller annual with tiny white corollas which is easily overlooked even when flowering in the same habitat and at the same time as *H. crassifolia*. Consequently, this southern white-flowered *Hedyotis australis* W.H. Lewis & D.M. Moore [*Houstonia micrantha* (Shinners) Terrell] is infrequently collected even when common. A third very small bluet with large pink- or rose-colored corollas, *Hedyotis rosea* Raf. [*Houstonia rosea* (Raf.) Terrell], is more narrowly distributed and occurs in eastern Texas, Louisiana, central and southern Arkansas, western Mississippi, and southeastern Oklahoma, with outlying populations in Alabama (Tuscaloosa Co.) and in 1931 southeastern Missouri (Dunklin Co.).

During March 2005, collections were made of these species concentrating on areas where *H. australis* was unreported but could be expected to occur. Find-



ing these small bluets by their distinct flower colors of purple-violet, white, and pink-rose is one of the best ways to identify them. In addition, corolla tubes of *H. australis* are short with calyx lobes as long as or longer than the tubes (Fig. 1), while lobes of *H. crassifolia* are much shorter than its longer tubes. However, without these floral characters their discovery is greatly limited even when growing side by side as they often do, and particularly since anthesis is confined to a few weeks at most. All collections were made by Walter H. Lewis and Memory Elvin-Lewis; their numbers and herbaria of deposit are provided for each collection cited. Many additional ones are at MO.

Cytological differences also exist between these species: *H. crassifolia* is diploid,  $2n = 2x = 16$ ,  $x = 8$ , *H. australis* is tetraploid,  $2n = 4x = 32$ ,  $x = 8$ , and *H. rosea* is diploid,  $2n = 2x = 14$ ,  $x = 7$ , a reduced base number from the others. That chromosomal reductions, and to some extent polyploidy, have played important roles in the evolution of these and other North American species of *Hedyotis* (Lewis 1965) is supported by recent molecular phylogenetic analyses by Church (2003) who further found that "*Houstonia* is not distinct from either North American *Hedyotis* or *Stenaria*." Additional research is needed for North American (including Mexican) taxa and others worldwide before generic- and tribal-level complexes of both the Hedyotideae and Spermacoceae are satisfactorily resolved. Clearly, this paper does not provide additional data regarding classification and phylogeny, for it is intended only to extend certain species distributions and comment briefly on specific ecologic and reproductive observations.

To aid the reader in identifying the three species, as well as two forms of *H. crassifolia*, f. *crassifolia* and f. *albiflora* (Standley) W.H. Lewis, characters were obtained from Lewis (1970), Smith (1988), Terrell (1996), and herbarium collections at BRIT and MO:

1. Corollas white, lobes and tube each 1.5–2.5 mm long; calyx lobes as long as or longer than corolla tube (Fig. 1) \_\_\_\_\_ **australis**
1. Corollas purple-violet or pink-rose, rarely white, tube exceeding length of calyx lobes.
  2. Stems 3–12 cm long; corollas purple-violet, occasionally pale purple to white, lobes 2.5–3.5 mm long, tube 3.5–4.5 mm long; calyx lobes about half as long as corolla tube; common \_\_\_\_\_ **crassifolia**
  3. Corollas purple-violet throughout \_\_\_\_\_ f. **crassifolia**
  3. Corolla lobes white to pale purple-violet, tube purple-violet to reddish \_\_\_\_\_ f. **albiflora**
2. Stems 1–3 cm long, often clumped; corollas pink-rose fading to light violet or nearly white, lobes 2.5–4.5 mm long, tube 5–7 mm long; calyx lobes 1.2–2.5 mm long; occasional \_\_\_\_\_ **rosea**

### **Hedyotis australis**

Prior to 2005 the known continuous distribution of *H. australis* was limited to eastern Texas, Louisiana, Arkansas (excluding the northeast), southeastern Oklahoma (only McCurtain Co.), western and central Mississippi, and southwestern Tennessee (only Shelby Co.), in addition to outlying populations in cen



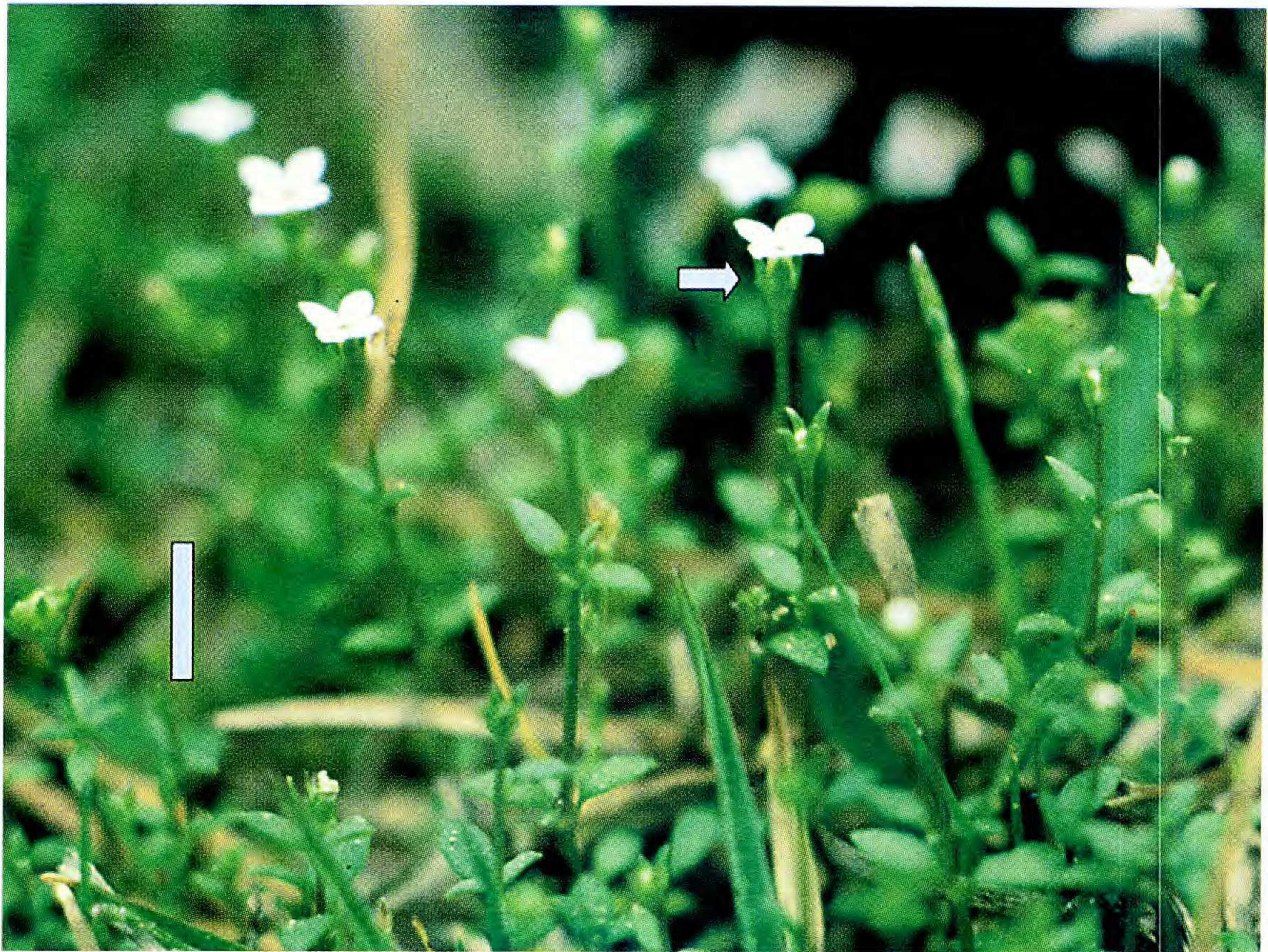


FIG. 1. *Hedyotis australis* W.H. Lewis & D.M. Moore common in lawn of cemetery, Natchitoches, Natchitoches Parish, Louisiana, W.H. Lewis 15867 (MO). Arrow showing calyx lobes as long as corolla tube (sometimes longer). Bar equivalent to about 1 cm.

tral Alabama (Tuscaloosa Co.), and central and eastern Georgia (Bibb and Columbia Co.'s) (Chambers 1965, Lewis 1968, Terrell 1996). Its current distribution is now extended to include:

(1) *southeastern Missouri*.—northern Dunklin Co., N of Campbell, 15968 F, MO, UMO, US; northern Dunklin Co., NW of Campbell, 15969 MO; Butler Co., Poplar Bluff, 15970 MO, US. These are the first reports for Missouri. The Poplar Bluff collection at 36°76'N is the most northerly record of the species, although this distribution is similar to the new record at Paris, Tennessee (36°17'N). *Hedyotis australis* was found in Missouri's Bootheel region and adjacent Butler County in low foothills at the southeastern edge of Ozark Plateau where all three collections grew in grassy cemeteries and where herbicides were not used. None were found in nearby pastures or meadows or in lower-lying areas where cotton is now grown in large farms and where herbicides are widely used. The species was also absent from flood-plains and other riparian habitats to the east along the Mississippi River valley.

(2) *northeastern Arkansas*.—Greene Co., Paragould, 15921 MO, 15964 BRIT,



MO. As in Missouri *H. australis* was not found in the Mississippi River valley, but only along a low ridge just west of the Missouri Bootheel among grass in a hilly cemetery. This is its most northeasterly location in Arkansas which parallels its northwestern distribution (Smith 1988).

(3) *western panhandle of Florida*.—Escambia Co., Hwy 4 at Sandy Hollow Rd, 15936 FSU, MO, USF. This new outlying record was found in a hilly region of extreme northwestern Florida growing with *H. crassifolia* in grass by a roadside corner. Both species were in flower 22 March, although flowering had just begun for *H. australis* (no mature capsules) compared with numerous flowers and maturing capsules of *H. crassifolia*. Tetraploids like *H. australis* often have peak flowering later than their diploid relatives (as *H. crassifolia*) and this generalization applies here (Lewis 1980). *Hedyotis australis* was not seen elsewhere in Escambia County, adjacent Santa Rosa County, or nearby Mississippi and Alabama, although *H. crassifolia* was found with regularity.

(4) *eastern Mississippi*.—Hinds Co., Hwy 27 at Bear Creek Rd, 15930 BRIT, MO; Smith Co., Taylorsville, 15932 MISS, MO, US; Itawamba Co., Fulton, 15950 DAO, MO; Lee Co., Tupilo, 15951 MISS, MO; Union Co., New Albany, 15953 MO, US; Marshall Co., Holly Springs, 15954 MISS, MO. In Mississippi's southeastern area *H. australis* was only occasionally found along grassy roadside verges, but where found it was common while *H. crassifolia* was less so (Hinds, Smith Co.'s); in the northeast it was widespread in the more frequent upland areas (Itawamba Co., the most easterly Mississippi collection, Lee, Union, Marshall Co.'s) where *H. crassifolia* was also less common. Observation of fewer flowering plants suggests that flowering of *H. crassifolia* had peaked some time earlier rather than limited frequencies of plants.

(5) *western Alabama*.—Marion Co, Hamilton, 15949 BRIT, MO, US. Plants of this second collection known for Alabama were growing in abundance among other invaders in lawns. This new extension eastward in Alabama from those found in nearby northeastern Mississippi is about 80 miles northwest of the only other known Alabama collection at Tuscaloosa in Tuscaloosa Co. (Terrell 1996) where *H. australis* was re-collected (15945 BRIT, MO, US) growing with *H. crassifolia* (15946 BRIT, MO) and nearby (ca. 20 m) *H. rosea* (15947 BRIT, MO, US), the most easterly record for this species.

(6) *western Tennessee*.—Tipton Co., Covington, 15926 MO; Fayette Co., Hwy 57 at Hwy 18, 15956 MO, US; Hardeman Co., near Bolivar City, 15957 MO, TENN; Gibson Co., Humboldt 15960 MO, TENN, Bradford 15961 MO, TENN; Henry Co., Paris, 15962 MO, TENN. To the one collection of *H. australis* previously reported in the extreme southwestern part of the state at Memphis (Shelby Co.) (Terrell 1996) are added numerous collections throughout western Tennessee as far east as 88° 15' W in Fayette, Gibson, Hardeman, Henry, and Tipton Counties found in lawns, hillsides, ruderal areas, and cemeteries. As in Missouri, the species was not found in the Mississippi River valley, but did occur with some frequency on



the eastern ridge and uplands eastward and as far north as near the Kentucky state line to Mississippi in the south. Although the species was not found in western Kentucky, it might occur there.

### **Hedyotis crassifolia**

Many collections were made of *H. crassifolia* whose range, including *H. minima* (Beck) Torrey & Gray, extends from Maryland to Georgia west to Wisconsin and Iowa, and south from Kansas to central Texas along the Gulf Coast states to the panhandle of Florida (Terrell 1996). Often it occurs with *H. australis* and less commonly also with *H. rosea*, particularly in eastern Texas and Louisiana where all three species can be found in flower together. All are homostylous with different chromosome numbers; recently Church (2003) found *H. crassifolia* with cleistogamous flowers among greenhouse-grown plants. Inbreeding is clearly predominant and no hybrids between the three species have been found. Thus, I was surprised to observe foraging in a population of *H. crassifolia* a bee, *Agapostemon virescens* (Halictidae), extending its proboscis into the corolla tube while wings beat and rapidly flying from one flower to another after a few seconds stay. It visited about 30 flowers (occasionally returning to the same one) of 12 or so plants during 3–4 minutes and then flew off. This occurred near the Appalachian ridge in Alabama, Clay Co., at the Baptist Church cemetery adjacent Highway 49, 23 March. No other species of *Hedyotis* was found in the vicinity; in fact few species were in flower. How common such visits might be in the early spring (few pollinators seen) is unknown, but that it was observed even once suggests a means of at least limited outcrossing for this homostylous species. One could venture that its distributional success covering a wide range of habitats compared to other related winter annuals might be due to the success of even secondary out-crossing in combination with inbreeding via homostyly and possibly cleistogamy.

### **Hedyotis rosea**

In representative specimens for *H. rosea* Terrell (1996) includes a collection from Missouri in Dunklin Co., near Campbell, 5 April 1931, collected by A.L. Grant s.n. (MO). Recently George Yatskievych located a second sheet collected by Julian Steyermark 406 (MO) on the same day, both undoubtedly made during the same collecting trip. Steyermark's label locality is more precise at "ca. 5 miles northwest of Campbell" in open flat ground surrounded by *Quercus phellos* woods. This is the same area of northern Dunklin Co. where new records of *H. australis* were found only in "protected" (from herbicides) cemeteries on 28 March 2005. Searches around Steyermark's locality, in much of the northern part of the county, and in neighboring counties proved fruitless. I suggest that this single outlying population collected in 1931 is extinct and that *H. rosea* is now extirpated from the Missouri flora. No collection has been found in neighbor-



ing Arkansas or Tennessee and the nearest *H. rosea* in central Arkansas (Terrell 1996) is about 175 miles southwest of the original Missouri find. Indeed the loss of habitat and heavy use of herbicides for many years in the Bootheel counties may have contributed to the loss of *H. rosea* and perhaps other species whose ranges once extended to this region.

#### ACKNOWLEDGMENTS

I thank Memory Elvin-Lewis, Washington University, who assisted me in the field during both 2005 collecting trips, Richard Clinebell, entomologist with the Missouri Botanical Garden, who determined the bee discussed under *Hedyotis crassifolia*, and N. Rogerio Castro for translating the Abstract into Spanish. I also acknowledge the use of important collections of *Hedyotis* at BRIT and MO.

#### REFERENCES

- CHAMBERS, K.L. 1963. *Hedyotis australis* in Georgia. *Rhodora* 65:271–273.
- CHURCH, S.A. 2003. Molecular phylogenetics of *Houstonia* (Rubiaceae): descending aneuploidy and breeding system evolution in the radiation of the lineage across North America. *Molec. Phylogenetic Evol.* 27:223–238.
- LEWIS, W.H. 1965. Pollen morphology and evolution in *Hedyotis* subgenus *Edrisia* (Rubiaceae). *Amer. J. Bot.* 52:257–264.
- LEWIS, W.H. 1968. Notes on *Hedyotis* (Rubiaceae) in North America. *Ann. Missouri Bot. Gard.* 55:31–33.
- LEWIS, W.H. 1970. *Hedyotis* L. In: D.S. Correll and M.C. Johnston. *Manual of the vascular plants of Texas*, Texas Research Foundation, Renner. Pp. 1487–1490.
- LEWIS, W.H. 1980. Polyploidy in species populations. In W.H. Lewis, ed. *Polyploidy: Biological relevance*. Plenum Press, New York. Pp. 103–147.
- SMITH, E.B. 1988. An atlas and annotated list of the vascular plants of Arkansas, ed. 2. Published by the author, Fayetteville, AR.
- TERRELL, E.E. 1996. Revision of *Houstonia* (Rubiaceae-Hedyotideae). *Syst. Bot. Monogr.* 48. The American Society of Plant Taxonomists.